Additionally, traffic volume is projected to increase with the Preferred Alternative. On average, intersections under the Preferred Alternative will have about 30 percent more volume than they would under the No-Build Alternative. In terms of impacts, the increase in volume translates into greater visibility for businesses.

During construction, municipalities may experience a loss of sales tax revenue as a result of businesses in the area experiencing loss of sales. Table 3-11 shows the estimated loss of sales tax revenue based on revenue estimates. These estimates assume that sales will decrease between five to ten percent for a 12-month construction period.

Table 3-11: Potential Revenue Loss Summary

Location	Five Percent	Percent of Budget	Ten Percent	Percent of Budget
Highland	$10,249	0.15%	$20,498	0.31%
Lehi	$9,501	0.03%	$19,002	0.07%
Utah County	$9,878	0.01%	$19,757	0.02%
UTA	$21,725	0.01%	$43,450	0.02%

Any loss of revenue would only be experienced during construction and many, if not most, of the potential loss in sales would be made up elsewhere within the county. During construction, customers would seek out more convenient places to shop. However, it is likely that they would choose a store that is still located in the area. Therefore, the actual loss in sales tax revenues to the county may be much less than estimated here. After construction, sales tax revenues would likely increase in proportion to the projected increase of sales. This increase may result from the improvements to travel time and traffic volume along the SR-92 corridor.

Induced impacts are changes in a region's economic activity as a result of a new investment; in this case, the improvements along SR-92 are the new investments. Induced impacts are calculated using the State of Utah's economic model, which measures the impact of a new investment on the regional economy. Table 3-12 summarizes the amount of federal spending assumed for the No-Build and Preferred Alternatives as well as the associated induced-employment growth and earnings for these alternatives.

Table 3-12: Induced Impacts Associated with Each Alternative

Alternative	Total Project Cost	Total Federal Investment	Employment	Earnings
No-Build	0	0	0	0
Preferred	$250,000,000	$30,000,000	378	$15,300,000

Source: State of Utah Economic Impacts Model

Mitigation

During Construction

To off-set the negative, direct impacts associated with business disruptions during the time of construction, potential mitigation measures include the following:

- Using project websites, variable message signs, mailers, and door-to-door visits, provide the public with information on construction updates. Provide notification of alternate routes at least one week before any lane closures or access restrictions.

- Implement the maintenance-of-traffic plan to ensure traffic flow and safety. This may include the use of barriers, temporary traffic signals, temporary crosswalks, and pedestrian signals as well as limiting construction activities during peak-hour travel times.
- Ensure business accessibility by providing up-to-date construction information to business owners, signing changes in access, controlling dust and debris, and scheduling utility interruptions outside of normal business hours.

Post Construction

Post-construction of the Preferred Alternative will have a positive economic impact on the businesses and localities within the study area. Since no long-term, negative economic impacts are anticipated, no mitigation measures have been identified.

3.5 PEDESTRIAN AND BICYCLIST CONSIDERATIONS

Regulatory Setting

The USC's Title 23 (Section 217) requires that bicycle and pedestrian accommodations be considered in new transportation projects. FHWA policies, UDOT policy 7-117, the Americans with Disabilities Act, and the American Association of State Highway and Transportation Officials (AASHTO) also provide guidance and/or requirements for bicycle and pedestrian facilities on transportation projects.

Affected Environment

Pedestrians

Existing facilities for pedestrians within the study area are concentrated at the eastern end of the corridor in Highland City and are depicted in Figure 3-12. Sidewalks are not currently present along SR-92 west of 6400 West, although some side streets do have sidewalks that terminate at SR-92. The SR-92 trail, also known as 11000 North Trail, is adjacent to SR-92 from 6400 West to 5300 West. The trail is maintained by Highland City and is used primarily as a sidewalk for transportation use. Pedestrian activity is higher in the eastern part of the corridor, beginning east of 6400 West, where more development is adjacent to SR-92 and sidewalk facilities are available for use. Highland City has constructed sidewalk and trail facilities along several sections of SR-92. In some areas, these consist of a 29-foot wide landscape strip containing a five-foot wide meandering sidewalk.

Pedestrian facilities also exist where 6000 West, 5300 West, and 4800 West intersect with SR-92. These pedestrian facilities are equipped with crosswalks, pedestrian push-buttons, and pedestrian signal heads.

Pedestrian facilities on SR-92 outside Highland City are limited. The Traverse Mountain developers built sidewalks on SR-92 immediately surrounding their entry monuments, but these do not extend more than 100 feet in either direction along SR-92. Traverse Mountain also constructed a pedestrian bridge adjacent to the railroad bridge over Cabela's Drive. This bridge does not connect to any bicycle or pedestrian facilities.

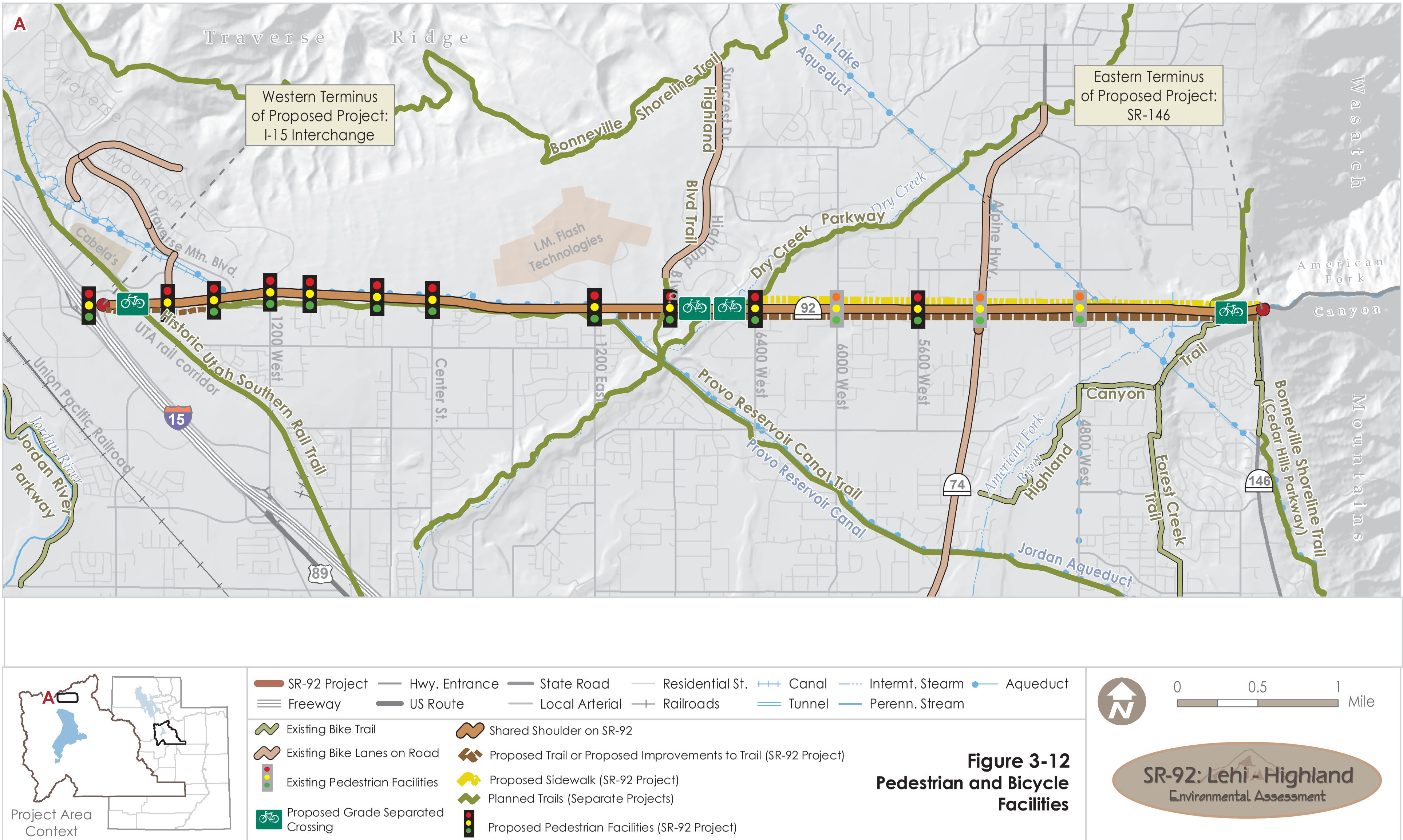

Figure 3-12
Pedestrian and Bicycle Facilities

The MAG travel demand model provides estimates on non-motorized trips, including both pedestrian and bicyclist trips, in the study area for 2005 and 2030. These are shown in Table 3-13.

Table 3-13: Non-Motorized Trips in the Study Area

Zone No.	Description	2005 Trips	2030 Trips	Total Change	Percent Change
1004	Traverse Mountain	115	10147	10033	8731%
1005	Traverse Mountain	36	345	309	863%
1006	IM Flash	422	1921	1499	355%
1007	Highland City	639	1104	465	73%
1010	Highland City	276	374	98	35%
1011	Highland City	2059	2564	505	25%
1013	Highland City	971	1605	634	65%
1014	Highland City	2002	2980	978	49%
1015	Highland City	800	1045	245	31%
1020	Lehi, South of SR-92	764	2000	1236	162%
1021	Lehi, South of SR-92	2127	5074	2946	138%

The degree to which non-motorized trips may increase between 2005 and 2030 is shown in the above table's column indicating percent change. Overall, non-motorized trips will increase throughout the study area. In the areas like Traverse Mountain and IM Flash, a substantial increase of non-motorized trips is projected. Most of these non-motorized trips will likely stay within the limits of these development areas, which have residential, commercial, and park land uses proposed. Therefore, fewer trips are expected to exit the developments onto SR-92 and into adjacent areas. In Highland, where much of the land is already developed, the increase shown for non-motorized trips is smaller in comparison to the areas in Lehi where a substantial amount of development is proposed.

Bicycles

As depicted on Figure 3-12, shared shoulders are located along the roadways of SR-92, Alpine Highway, and Triumph Boulevard. While SR-92 is not designated as a bicycle route, it is nevertheless popular with road cyclists. At least one annual race uses SR-92, and SR-92 is a popular route for cyclists accessing American Fork Canyon. However, the road is not heavily used by bicyclists or pedestrians on an average daily basis.

Bicycle and pedestrian counts were collected at various intersections along existing SR-92. The following table indicates the number of bicyclists and/or pedestrians at the intersection locations during the P.M. peak hour.

Table 3-14: Bicyclist and Pedestrian Counts During P.M. Peak Hour

Intersection	Northbound	Southbound	Eastbound	Westbound
SR-92/Frontage Road	0	0	0	0
SR-92/Triumph Boulevard	0	0	1	0
SR-92/Center Street	0	0	0	0
SR-92/IM Flash East	1	3	0	0
SR-92/Highland Boulevard	0	1	0	0
SR-92/6400 West	5	2	0	0
SR-92/6000 West	0	0	0	2

Intersection	Northbound	Southbound	Eastbound	Westbound
SR-92/5600 West	0	4	7	13
SR-92/5300 West	4	1	2	4
SR-92/4800 West	8	9	5	1

Trails
Several multi-use trails exist and are planned within the study area. These trails are designed for recreational use and accommodate pedestrians and bicyclists. These trails are described in Section 3.3.4 of this chapter and are depicted in Figure 3-12.

Impacts

No-Build Alternative
Under the No-Build Alternative, the condition of SR-92 for bicyclists and pedestrians would remain the same as it is now. The trail facilities planned in the study area—as described in Section 3.3.4 of this chapter and depicted in Figure 3-9—would be built in both the Preferred and No-Build Alternatives. Additionally, the pedestrian and bicycle improvements associated with the implementation of the Preferred Alternative, as described below, would not be made under the No-Build Alternative.

Preferred Alternative
As part of the Preferred Alternative, several improvements are proposed for pedestrian and bicycle facilities within the study area. The Preferred Alternative incorporates various crossing facilities for pedestrians at SR-92 intersections. These facilities include crosswalks and pedestrian signals; see Figure 3-12 for more detail. Other improvements associated with the Preferred Alterative include the following:

- A ten-foot wide trail in a 29-foot landscaped strip on the south side of SR-92 between 6400 West and SR-74.
- A five-foot sidewalk in a 29-foot landscaped strip on the north side of SR-92 between 6400 West and SR-74.
- A ten-foot wide trail on the south side of SR-92 between SR-74 and SR-146.
- A five-foot wide sidewalk on the north side of SR-92 between SR-74 and SR-146.
- A ten-foot trail between I-15 and Traverse B connecting the Provo Reservoir Canal Trail.
- An eight-foot, shared-use shoulder for cyclists, parking, and/or disabled vehicles along the entire length of the project.
- Grade-separated trail crossings at the Highland Boulevard Trail, the Dry Creek Parkway, and the Bonneville Shoreline Trail. (These crossings may require construction phasing if funding is not available all at once.)
- Future trail accommodations for the Historic Utah Southern Rail Trail.

The wider right-of-way width associated with the Preferred Alternative would likely result in impacts to pedestrians and bicyclists. Grade-separated crossings for trail facilities would need to be longer to span the proposed roadway improvements. Longer crossing distances would result in more traffic exposure and higher risks for bicyclists and pedestrians. Bicyclists traveling along SR-92 would experience a decrease in safety in the areas where the express-lane merge ramps will be located. However, the trail improvements proposed under the Preferred Alternative will provide bicyclists with an alternate route to traveling on SR-92. Additionally, the grade-separated crossings proposed under the Preferred Alternative would provide safer crossings for bicyclists than what currently exists.

During construction of the Preferred Alternative, it is likely that road cyclists and pedestrians utilizing the existing facilities along SR-92 would be temporarily impacted by construction; access and continuity of these facilities may be inhibited.

Mitigation

Under the Preferred Alternative, the following bicycle and pedestrian facilities will be constructed:

- A ten-foot wide trail in a 29-foot landscaped strip on the south side of SR-92 between 6400 West and SR-74.
- A five-foot sidewalk in a 29-foot landscaped strip on the north side of SR-92 between 6400 West and SR-74.
- A ten-foot wide trail on the south side of SR-92 between SR-74 and SR-146.
- A five-foot wide sidewalk on the north side of SR-92 between SR-74 and SR-146.
- A ten-foot wide trail between I-15 and Traverse B connecting the Provo Reservoir Canal Trail.
- An eight-foot wide, shared-use shoulder for cyclists, parking, and/or disabled vehicles along the entire length of the project.
- Grade-separated trail crossings at the Highland Boulevard Trail, the Dry Creek Parkway, and the Bonneville Shoreline Trail. (These crossings may require construction phasing if funding is not available all at once.)
- Future trail accommodations for the Historic Utah Southern Rail Trail.

These crossings will provide improved connectivity and access for pedestrians and bicyclists along SR-92.

The Preferred Alternative will accommodate both northbound and southbound surface street access to trails. For signalized intersection design, considerations will be made to offset the potential safety concerns associated with the wider right-of-way width. These design options may include painting crosswalks to designate pedestrian spaces at intersections, providing pedestrian signals and countdown timers, and installing audible signals. Where express lanes merge with SR-92, advisory signs will be placed to notify motorists of the presence of cyclists.

During construction, access to the existing SR-92 bicycle and pedestrian facilities will be maintained as much as possible.

3.6 AIR QUALITY

Regulatory Setting

National Environmental Policy Act (NEPA) guidance, provided by FHWA's *Guidance for Preparing Environmental Documents* (T6640.8A), recommends that both mesoscale and microscale air quality concerns be discussed in an environmental air quality analysis. Mesoscale concerns refer to project impacts on regional air quality, and microscale concerns are related to localized or project-level air quality impacts.

Mesoscale concerns are generally addressed by the metropolitan planning organization (MPO) in the long-range transportation planning process and in the transportation improvement program. The MPO for SR-92 is MAG. Microscale concerns refer to the localized emissions of carbon monoxide (CO), particulate matter (PM) less than 10 microns diameter (PM_{10}), PM less than 2.5 microns diameter ($PM_{2.5}$), and mobile source air toxics (MSATs) from a given project—often called hot spot analysis. Microscale or project-level air quality impacts are generally not addressed by the mesoscale or regional-level assessment and must be evaluated during the environmental analysis of each project.

Both mesoscale and microscale air quality concerns are assumed to be addressed when the proposed project meets the requirements of the Clean Air Act (CAA) as amended. Transportation projects are said to conform to air quality standards if the proposed project meets the requirements of Section 176(c) of the CAA and does not alone or in combination with other planned projects do the following: create a new violation of the National Ambient Air Quality Standards (NAAQS), worsen existing violations of the NAAQS, or delay attainment of the NAAQS in non-attainment or maintenance areas.

Air Quality Conformity Requirements

The CAA (42 USC 7476[c]) requires federal actions to conform to the statewide transportation improvement program (STIP) approved under Section 110 of the CAA. The Transportation Conformity Rule (40 CFR Sections 51 and 93) establishes standards and guidelines to be followed when determining whether or not a proposed transportation project conforms to the STIP. Specifically, the proposed transportation project must be part of a long range transportation plan, which demonstrates that the proposed project, when analyzed regionally with all other proposed transportation improvement projects, conforms to the control strategies and emissions levels outlined in the STIP.

The Preferred Alternative alignment for the SR-92 project is consistent with MAG's *Regional Transportation Plan* (RTP). The RTP was adopted by MAG in March of 2005 and found to conform to air quality standards by USDOT on June 2, 2005. The proposed improvement to SR-92 is included in MAG's 2007 RTP, and a conformity determination has been completed. Utah County is presently a non-attainment area for PM_{10}. A STIP is in effect for Utah County and was approved in July of 2002.

Affected Environment

Mesoscale Analysis

Under Titles 23 and 49 of the USC, MPOs must have transportation plans in place that present at least a 20-year perspective for future transportation improvements for their region. The LRP is subjected to regular and ongoing analysis to determine whether the plan as a whole conforms to applicable environmental regulations. For air quality purposes, the projects listed in the RTP cannot cause the air quality standards to exceed NAAQS or worsen current NAAQS violations. The inclusion of the SR-92 project in the RTP implies that MAG has studied the overall regional impacts of building the proposed project, has consulted other involved agencies such as Utah's Department of Air Quality (DAQ), and does not anticipate that the project will have a detrimental impact on the regional air quality attainment status.

The SR-92 project is also included in UDOT's STIP. The STIP is a multi-year prioritized list of projects. The STIP must be consistent with the conforming RTP and must also conform to the DAQ's statewide improvement program (SIP). Specifically, the RTP and the STIP must result in emissions consistent with those allowed (or budgeted) for in the SIP. The inclusion of the SR-92 project in the STIP indicates that estimated air emission increases created by building the SR-92 project have been subjected to a conformity analysis by MAG and UDOT, and the project will not create a local or regional exceedance of NAAQS.

Microscale Analysis

In addition to this regional analysis, localized project analysis is also required in CO and PM_{10} non-attainment areas. Although the project is outside the CO non-attainment area boundary, the entire project has been screened for its possible effect on CO concentrations. Quantitative hot spot analysis of CO was performed using the screening and modeling methodology in UDOT's *Air Quality Hot Spot Manual* and is described in the Impacts section below.

Currently, Utah County is a non-attainment area for PM_{10}. Hot spot $PM_{2.5}$ and PM_{10} analysis methodology has not been adopted by the Environmental Protection Agency (EPA) so quantitative localized analysis is not required until a methodology is adopted.

FHWA has developed qualitative and quantitative analysis methodologies for MSATs. However, because this project is considered to have low potential for MSAT impacts, a qualitative assessment of the project corridor was performed for PM_{10} and MSATs and is described in the impact section below.

One intersection along the corridor—the SR-92 and Triumph Boulevard intersection in Lehi—and one mainline section–between Triumph Boulevard and 1200 West–were selected for further analysis. Projected traffic data indicate that this intersection and mainline section serve one of the highest volumes of traffic and has the poorest LOS within the project right-of-way.

Impacts

No-Build Alternative

Existing traffic congestion and delay are expected to increase under the No-Build Alternative, which could have an adverse affect on air quality. Since no federal action is required for the No-Build Alternative, air quality impacts are addressed qualitatively in this section to provide for a comparison against the Preferred Alternative.

As described in UDOTs *Air Quality Hot Spot Manual*, mainline volumes of 50,000 vehicles per day and mainline intersection volumes less than 45,000 vehicles per day are unlikely to result in CO concentrations greater than the NAAQS. The No-Build Alternative does not exceed screening thresholds and would not pose a mainline problem. However, intersection traffic volumes are above the screening level analysis at most intersections, as shown in Table 3-15.

Table 3-15: 2030 No-Build Alternative Intersection Approach ADT Volume

Intersection	Intersection LOS	Average Daily Traffic	Screening Maximum Volume	Screening Pass/Fail
Frontage Road	F	45,750	45,000	Fail
Triumph Road	F	58,167	45,000	Fail
Traverse B	F	44,750	45,000	Pass
1200 West	F	47,250	45,000	Fail
Traverse D	F	35,625	25,000	Fail
500 West	F	38,458	25,000	Fail
Center Street	F	41,042	25,000	Fail
IM Flash Technologies West	F	35,875	25,000	Fail
1200 East	F	45,042	25,000	Fail
IM East	F	30,000	25,000	Fail
Highland Boulevard	F	33,833	25,000	Fail
6400 West	E	23,500	25,000	Pass

Intersection	Intersection LOS	Average Daily Traffic	Screening Maximum Volume	Screening Pass/Fail
6000 West	F	27,542	25,000	Fail
5600 West	F	29,083	25,000	Fail
5300 West	F	34,417	45,000	Fail
4800 West	C	28,125	45,000	Fail
SR-146	A	14,708	25,000	Pass

Preferred Alternative

Table 3-16 shows the 2030 predicted average daily traffic (ADT) volume and the maximum average daily traffic volumes that are considered pre-screened for segments of SR-92. Traffic volumes below screening levels are not expected to create CO hot spot concentrations that exceed the NAAQS.

Table 3-16: 2030 Predicted Preferred Alternative Mainline ADT Volume

Segment		2030 Average Daily Traffic Volume	Screening Level Traffic Volume	Screening Pass/Fail
From	To			
Frontage Road	Triumph Boulevard	50,083	50,000	Fail
Triumph Boulevard	1200 West	54,250	50,000	Fail
1200 West	1200 East	49,625	50,000	Pass
1200 East	Highland Boulevard	38,125	50,000	Pass
Highland Boulevard	6400 West	29,250	50,000	Pass
6400 West	6000 West	29,750	50,000	Pass
6000 West	5600 West	29,708	50,000	Pass
5600 West	5300 West	29,500	50,000	Pass
5300 West	4800 West	23,875	50,000	Pass
4800 West	SR-146	14,958	50,000	Pass

Two segments of the Preferred Alternative are shown to have 2030 mainline traffic volumes that exceed the maximum daily screening traffic volume. These segments may create violations of CO air quality standards. For that reason, the Preferred Alternative does not pass the simple CO screening analysis for microscale concerns along the mainline, and further analysis is required.

In addition to mainline screening, intersection CO screening was evaluated. Under the Preferred Alternative, the intersection of SR-92 and Triumph Boulevard is anticipated to operate at a LOS D. Table 3-17 displays intersection approach volumes in comparison to the intersection screening threshold volumes according to UDOT's *Air Quality Hot Spot Manual.*

Table 3-17: 2030 Preferred Alternative Intersection Approach ADT Volume

Intersection	Intersection LOS	Average Daily Traffic	Screening Maximum Volume	Screening Pass/Fail
Frontage Road	D	49,792	45,000	Fail
Triumph Blvd	D	51,458	45,000	Fail
Traverse B	C	35,958	45,000	Pass
1200 West	D	39,708	45,000	Pass
Traverse D	C	29,542	45,000	Pass
500 West	D	33,917	45,000	Pass
Center Street	C	35,542	45,000	Pass
IM Flash Technologies West	A	16,958	45,000	Pass
1200 East	C	40,833	45,000	Pass
IM Flash Technologies East	B	35,250	45,000	Pass
Highland Boulevard	D	40,583	45,000	Pass
6400 West	B	32,625	45,000	Pass

Because of the two mainline segments and the two adjacent intersections that exceeded screening levels, a localized hot spot analysis to quantify CO concentrations was performed for the mainline segment and intersection that exceeded screening levels by the highest level: the mainline segment between Triumph Boulevard and 1200 West and the intersection of SR-92 and Triumph Boulevard. By analyzing the impacts of this worst-case mainline segment and intersection, it can be assumed that air quality impacts from other mainline segments and intersections will be less.

<u>Carbon Monoxide</u>

The intersection of SR-92 and Triumph Boulevard and the mainline section between Triumph Boulevard and 1200 West were evaluated for CO. The EPA-approved CO screening model, CAL3QHC, was used to estimate one-hour concentrations of CO created by projected traffic at each selected intersection and the selected mainline portion of the project. Background CO levels used for hot spot modeling are based on the average of the most recent five years' monitoring data from both the North Provo and University Avenue monitoring stations as listed in Table 3-18.

To obtain the final eight-hour CO concentration, a persistence factor of 0.7 was used. The persistence factor represents CO concentration variation based on both traffic and meteorological conditions that may be present at the SR-92 project site. Both CAL3QHC guidance and UDOT's *Air Quality Hot Spot Manual* recommend a persistence factor of 0.7.

Using this factor, the one-hour CO model output concentration value was multiplied by the persistence factor to convert it to an 8-hour equivalent. The equation used for this calculation is CO8 = (CO1 * 0.7) + BG8. The following are definitions for each variable included in the equation:

- CO8: Adjusted CO eight-hour value
- CO1: One-hour model output value
- BG8: Eight-hour background CO
- 0.7: Persistence factor

Table 3-18: Background CO Levels for Utah County

	1-Hour Background (Part per Million [ppm])	8-Hour Background (ppm)
	4.5	2.74
NAAQS Limit:	**35 ppm**	**9 ppm**

CAL3QHC model analysis indicates that the intersection and mainline segment analyzed by modeling result in CO concentrations that are below the NAAQS. Table 3-19 displays the results of the CO hot spot analysis. Results conclude that there are no CO hotspot concerns associated with the Preferred Alternative.

Table 3-19: CO CAL3QHC Modeling Results

Intersection/ Mainline	1-Hour Concentration (ppm)			8-Hour Concentration (ppm)			Results
	Back-ground	Modeled (Including Back-ground)	Standard	Back-ground	Modeled (Including Back-ground)	Standard	
Intersection of SR-92 and Triumph Boulevard	4.5	7.4	35	2.74	4.8	9	Pass
Mainline Segment (Triumph Boulevard to 1200 West in Lehi)	4.5	5.7	35	2.74	3.6	9	Pass

Particulate Matter

PM_{10} concentrations are related to a combination of direct PM_{10} sources—such as fugitive dust that comes from increased vehicle miles of travel and nearby off-road sources—and secondary reactions of nitrogen oxide (NO_x) and sulfur oxide (SO_x), which form PM_{10} in the atmosphere. Because of the association of particulate violations occurring during prolonged winter inversions, it is assumed that traffic volumes and corresponding LOS have less impact on PM_{10} concentrations than larger, regional trends in emission rates and industrial controls. Therefore, it can be expected that PM_{10} in Utah County will remain a regional issue related to prolonged temperature inversions and a gradual build-up of PM_{10}-related pollutants; it will not be created by local PM_{10} concentrations along specific streets in fringe areas. In addition, the PM_{10} concentrations in Utah County have been declining in recent years. This is attributed to the implementation of improved emissions technology and more stringent diesel fuel standards. PM_{10} and $PM_{2.5}$ summary data for DAQ monitoring stations are listed in Tables 3-20 and 3-21.

Table 3-20: PM_{10} Monitoring Data Summary for Lindon Station, Utah County

Year	24-Hour PM_{10}			Annual PM_{10}	
	1st Max (µg/m³)	2nd Max (µg/m³)	Number of Exceedances	Annual Mean (µg/m³)	Number of Exceedances
1998	85	75	0	28	0
1999	94	91	0	32	0
2000	94	89	0	32	0
2001	111	101	0	34	0
2002	288	105	1	32	0
2003	150	118	0	25	0
2004	159	111	1	29	0
2005	86	77	0	25	0
2006	116	90	0	25	0
2007	125	112	0	28	0
NAAQS:	**150 µg/m3**			**50 µg/m3**	
Note: Effective December 2006, EPA revoked the annual PM_{10} NAAQS, it is included here for informational purposes only.					

Table 3-21: $PM_{2.5}$ Monitoring Data Summary for Highland Station, Utah County

Year	24-Hour $PM_{2.5}$				Annual $PM_{2.5}$	
	1st Max (µg/m³)	2nd Max (µg/m³)	98th Percentile (µg/m³)	Number of Exceedances	Annual Mean (µg/m³)	Number of Exceedances
2000	36	32	32	0	7.5	0
2001	73	67	54	0	10.2	0
2002	47	39	30	0	9.1	0
2003	36	25	23	0	7.1	0
2004	75	63	50	0	10.7	0
2005	43	36	34	0	8.1	0
2006	48	25	24	0	8.5	0
2007	71	57	52	1	10.1	0
NAAQS:	**35 µg/m³**				**15 µg/m³**	
Note: Effective December 2006, EPA has lowered the 24-hour $PM_{2.5}$ NAAQS from 65 µg/m³ to 35 µg/m³ and the annual NAAQS from 35 µg/m³ to 15 µg/m³.						

<u>Mobile Source Air Toxics</u>

Air toxics are an increasingly important air pollution issue. The CAA identifies 188 air toxics, which are also known as hazardous air pollutants. EPA has assessed this expansive list of toxics and identified a group of 21 MSATs, which are set forth in the EPA final rule *Control of Emissions of Hazardous Air Pollutants from Mobile Sources* (66 Final Rule 17235). EPA also extracted a subset of this list that is now labeled as the six priority MSATs. These are benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. Although these MSATs are considered the priority transportation toxics, EPA stresses that the lists are subject to change and may be adjusted in future rules. In addition, EPA has issued a number of regulations that will dramatically decrease MSATs through cleaner fuels and cleaner engines. According to an FHWA analysis, even if vehicle miles traveled (VMT) increases by 64 percent, reductions of 57 percent to 87 percent in MSATs are projected from 2000 to 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

EPA is the lead federal government agency responsible for the establishment of national air quality standards, national guidance, and guidelines for the uniform and scientifically reliable study of air pollutants. To date, neither NAAQS for MSATs nor national project-level guidelines or guidance to study MSATs under various climatic and geographic situations have been developed. Research into the contribution of mobile sources toward the emissions of air toxics is ongoing. Such limitations make the study of MSAT concentrations, exposures, and health impacts difficult and uncertain. Thus, accurate and reliable estimates of actual human health or environmental impacts from transportation projects and MSATs are not scientifically possible at this time.

FHWA has developed a tiered approach for analyzing MSATs in NEPA documents. Following FHWA guidance, this project is considered to have a low potential for MSAT effects because it does not add substantial new capacity or create a facility that is likely to meaningfully increase emissions. Detailed information about MSATs is included in a technical report and is available for public review upon request (Kleinfelder 2008).

Mitigation

Based on the analysis presented, the Preferred Alternative will not violate the NAAQS. Therefore, no mitigation is required.

3.7 NOISE

Regulatory Setting

Noise impacts due to highway traffic may adversely impact human activity and the quality of life of residents adjacent to heavily traveled roads. Guidelines and requirements for noise mitigation measures are included in UDOT's Noise Abatement Policy, 08A2-1. This policy is consistent with 23 CFR 772 (also known as Procedures for Abatement of Highway Traffic and Noise and Construction Noise), with Utah Code 72-6-111 and 112, with federal regulations.

Affected Environment

A noise technical analysis report was prepared for this project and included calculating noise levels for the existing conditions as well as the 2030 No-Build Alternative and 2030 Preferred Alternative.

Based on the land use activity categories that exist along the project corridor, the following noise abatement criteria (NAC), shown in Table 3-22, are applicable for properties adjacent to the project.

Table 3-22: UDOT Traffic Noise Abatement Criteria

Activity Category	Noise Abatement Criteria dBA*	Description of Activity Category
A	56 (Exterior)	Land where serenity and quiet are of significance and serve public need and where perseverance of these qualities is essential to serve the property's purpose.
B	66 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, hospitals, and cemeteries.
C	71 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	None	Undeveloped lands.
*Hourly A-weighted sound level in decibels (dBA) reflecting a 2 dBA approach value below 23 CFR values.		

Noise levels were measured at nine sites along the project corridor during the morning and afternoon peak travel times to characterize existing noise levels; see Table 3-23 for more detail. The locations of the field noise monitoring locations are shown on Figure 3-13.

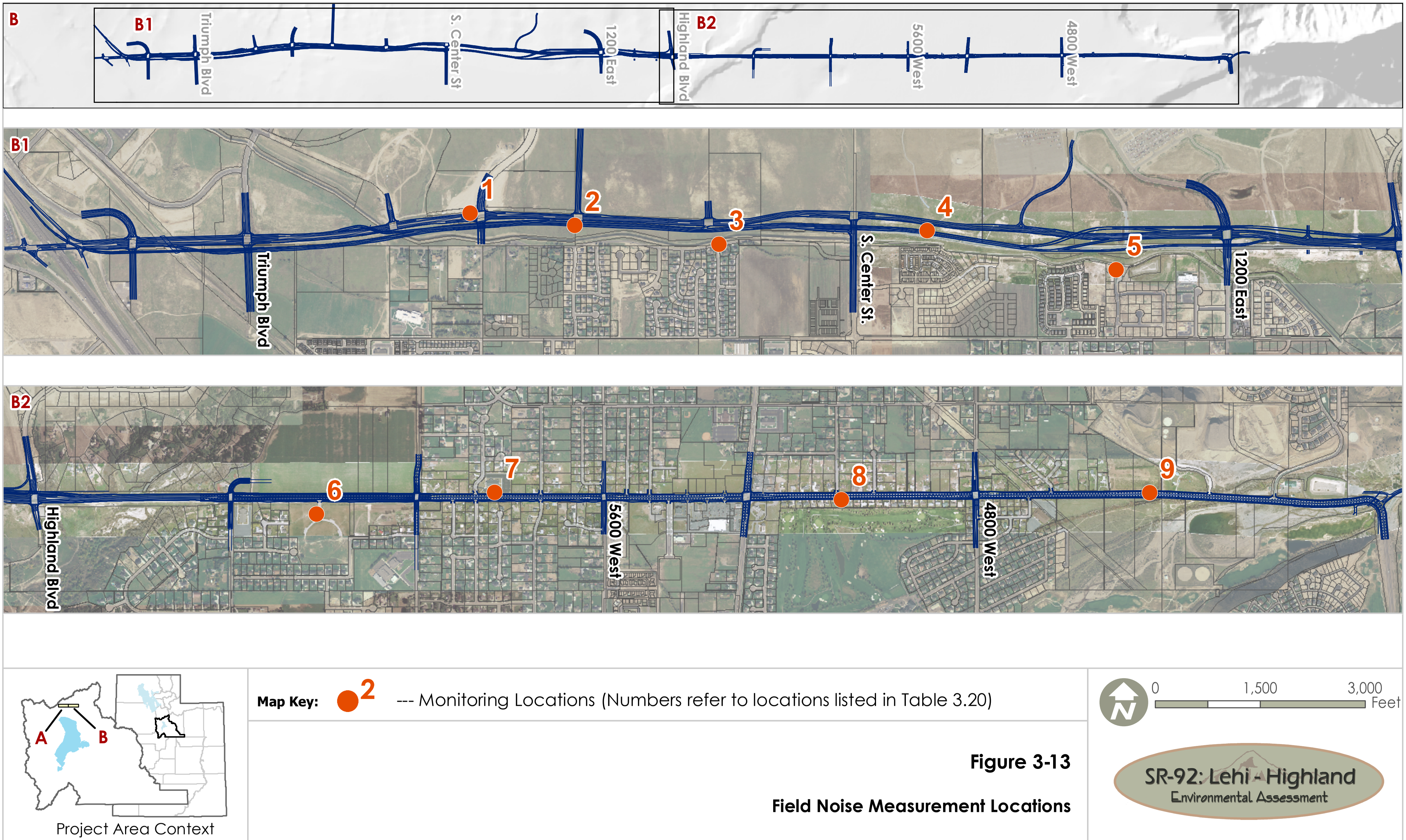

Figure 3-13

Field Noise Measurement Locations

Table 3-23: Field Noise Measurements

Monitor Location Number	Location	2007 Measured (dBA)	Site-Specific Noise Abatement Criteria (dBA)
1	Approximately 60 feet west of the east entrance of Traverse Mountain	67.7	None
2	Approximately 1000 West	65.7	None
3	500 West Bull River Road	57.9	66
4	Approximately 1025 feet east of Center Street	72.2	None
5	Approximately 3420 North 810 East	55.9	66
6	Cemetery located at 5378 West 10400 North	54.1	66
7	Church located at 5848 West 11000 North	63.4	66
8	Approximately 5077 West 11000 North	70.8	66
9	Approximately 4380 West 11000 North	73.2	None

Impacts

A traffic noise impact occurs under either of the following conditions:

- The design noise level is greater than or equal to the UDOT NAC in Table 3-22 for each corresponding land use category.
- The design noise level is greater than or equal to an increase of 10 decibels (dBA) over the existing noise levels.

Traffic Noise Model (TNM), Version 2.5, was used to calculate the traffic noise level along the corridor for the current year (2007) and the future predicted worst-case traffic noise level along the corridor for the No-Build Alternative and Preferred Alternative. The future noise levels were modeled using worst-case traffic volumes for noise, which is classified as a LOS C.

No-Build Alternative

The model results estimated that 82 Category B properties along SR-92, including three churches and a cemetery, are currently impacted by noise levels of 66 dBA or higher. No Category C properties are currently impacted by noise levels of 71 dBA or higher. The model estimated values of 66 dBA between 25 and 290 feet from the roadway. Figure 3-14 shows the contoured model noise results and highlights each impacted property under existing conditions. The future No-Build Alternative noise levels are expected to impact 132 Category B properties, including three churches and a cemetery, and three Category C properties.

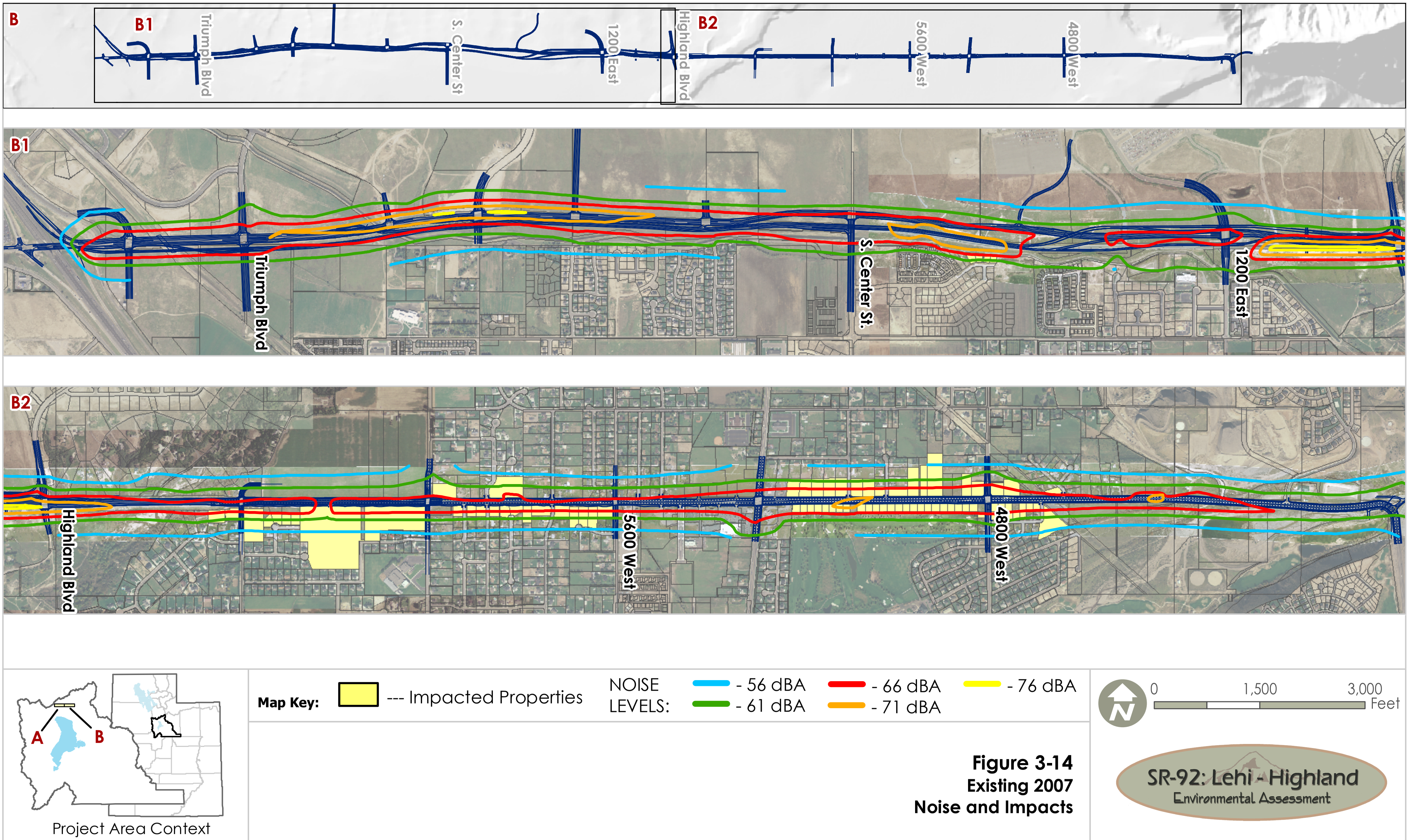

Figure 3-14
Existing 2007
Noise and Impacts

Preferred Alternative

With implementation of the Preferred Alternative, 2030 noise levels along SR-92 are expected to increase 0 to 13 decibels above existing noise levels at different locations along the corridor. The expected noise increase is a result of both increased traffic volumes and road design changes that include additional pavement in parts of Highland, the realignment of arterial lanes, and the addition of express lanes in Lehi. Figure 3-15 shows the location of each impacted property, both residential and commercial, that will experience a noise level above the acceptable UDOT NAC threshold. The figure also shows the location of impacted properties that have an increase greater than ten decibels above existing noise levels. A noise contour map is included in the noise technical report, which shows the noise levels for the existing 2007 conditions, the No-Build Alternative, and the Build Alternative.

The Preferred Alternative's model indicated that there would be noise impacts on 104 residences along SR-92, including three churches and a cemetery; the noise levels for these properties would be 66 dBA or higher. Three commercial properties may be impacted by noise levels of 71 dBA or higher.

A comparison of the existing measured 2007 noise levels and the future modeled noise levels for the Preferred Alternative and the No-Build Alternative is provided on Table 3-24.

Table 3-24: Comparison of Existing Versus Future Preferred Alternative and No-Build Alternative for Noise Monitoring Locations

Monitor Location Number	Measured 2007 Noise Level (dBA)	Modeled Future Preferred Alternative Noise Level (dBA)	Modeled Future No-Build Alternative Noise Level (dBA)
1	67.7	70.6	78.9
2	65.7	N/A	70.9
3	57.9	62.8	61.3
4	72.2	N/A	77.0
5	55.9	55	58.0
6	54.1	64.8	64.6
7	63.4	72.0	69.6
8	70.8	73.5	78.0
9	73.2	N/A	80.3

N/A: Not applicable because monitoring locations would be in the future roadway.

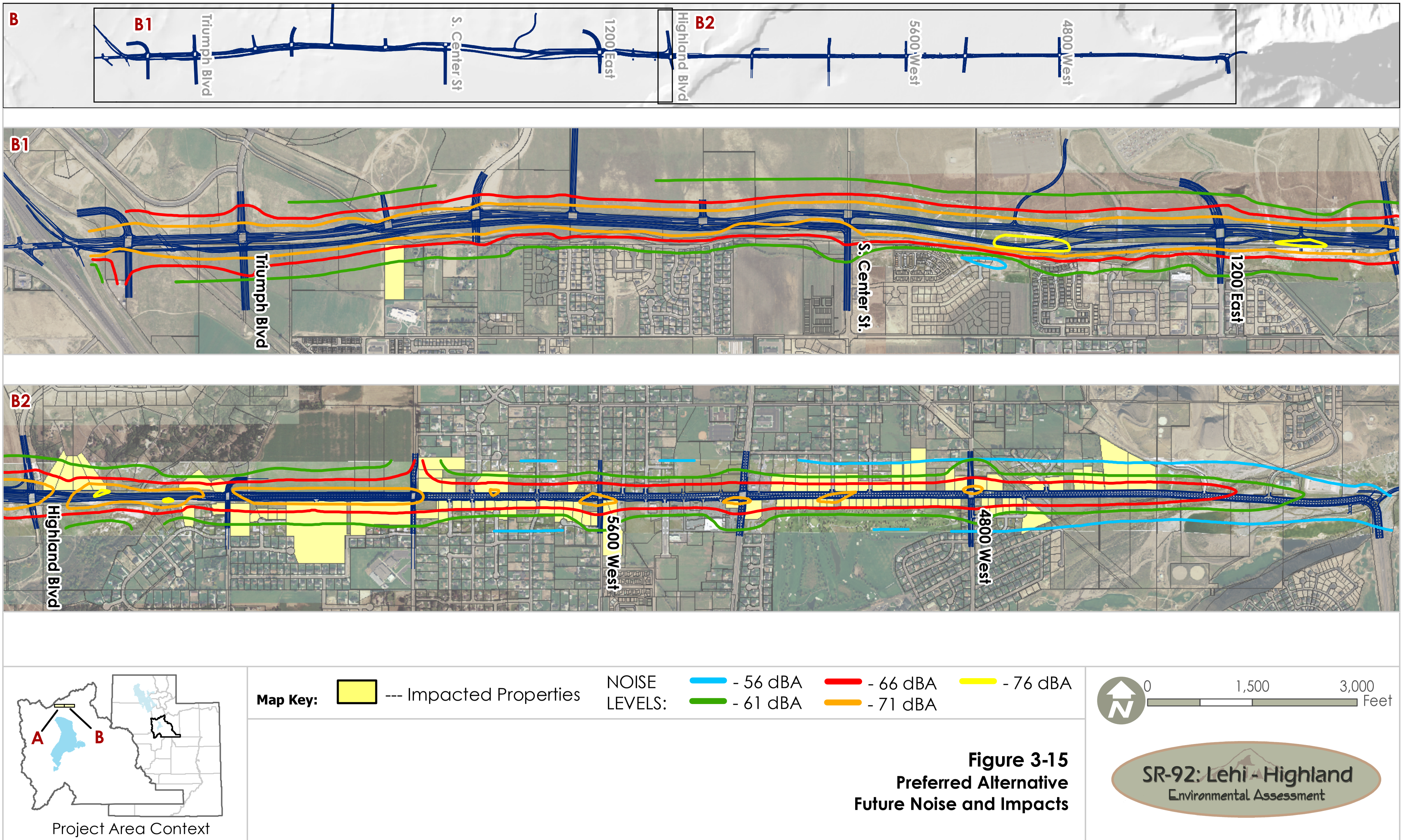

Figure 3-15
Preferred Alternative
Future Noise and Impacts

Mitigation

Noise abatement walls were modeled to assess their effectiveness as a mitigation option for impacted areas. To qualify for construction, the noise wall must meet state and federal regulations and be found to be reasonable and feasible. Mitigation measures are considered reasonable and feasible when noise levels are reduced by a minimum of 5 dBA, the cost of the mitigation is within UDOT standards, and engineering constraints are met. If reasonable, the mitigation measures must be approved by the impacted public. Table 3-25 provides a mitigation assessment of the areas that will be impacted by the Preferred Alternative. Figure 3-16 depicts the modeled noise wall locations. Although five of the assessed noise walls reduced noise levels, the cost of these noise walls would not be within UDOT standards.

Table 3-25: Mitigation Assessment

Impacted Area Location	Modeling	Results	Comments
Between 8970 and 9000 West S. SR-92 along EB Expressway, Lehi, UT	Noise Wall: South-1	South-1 does not reduce noise by 5 dBA	Noise wall is not feasible. [1b]
Between Highland Blvd. and 6700 West N. SR-92, Highland, UT	Noise Wall: North-1	North-1 does not reduce noise by 5 dBA	Noise wall is not feasible. [1b]
Between 6480 and 6400 West N. SR-92, Highland, UT	Noise Wall: South-2	South-2 does mitigate for one receptor	Noise wall is not feasible. [1b]
Between 6550 and 6400 West S. SR-92, Highland, UT	Noise Wall: North-2	North-2 does mitigate for one receptor	Noise wall is not feasible. [1b]
Between 6400 and 6290 West S. SR-92, Highland, UT	Noise Wall: South-3	South-3 does mitigate for one receptor	Noise wall is not feasible. [1b, 1c]
Between 6290 and 6192 West S. SR-92, Highland, UT	None	N/A	Noise wall is not reasonable [2b]
Between 6050 and 6000 West S. SR-92, Highland, UT	Noise Wall: South-4	South-4 does not reduce noise by 5 dBA	Noise wall is not feasible. [1b]
Between 6000 and 5800 West N. SR-92, Highland, UT	None	N/A	Noise wall is not feasible. [1a, 1d]
Between 6000 and 5920 West S. SR-92, Highland, UT	Noise Wall: South-5	South-5 does mitigate for one receptor	Noise wall is not feasible. [1b]
Between 5900 and 5870 West S. SR-92, Highland, UT	Noise Wall: South-6	South-6 does mitigate for two receptors	Noise wall is not reasonable. [2a]
Between 5870 and 5750 West S. SR-92, Highland, UT	Noise Wall: South-7	South-7 does mitigate for five receptors	Noise wall is not reasonable. [2a]
Between 5750 and 5730 West S. SR-92, Highland, UT	Noise Wall: South-8	South-8 does not reduce noise by 5 dBA	Noise wall is not feasible. [1b]
Between 5730 and 5600 West S. SR-92, Highland, UT	Noise Wall: South-9	South-7 does mitigate for four receptors	Noise wall is not feasible. [1b]
Between 5680 and 5600 West N. SR-92, Highland, UT	Noise Wall: North-3	North-3 does mitigate for one receptor	Noise wall is not reasonable. [2a]
Between 5600 and 5550 West S. SR-92, Highland, UT	None	N/A	Noise wall is not feasible. [1c]
Between 5345 and 5255 West S. SR-92, Highland, UT	None	N/A	Noise wall is not feasible. [1c]
Between 5222 and 5100 West N. SR-92, Highland, UT	None	N/A	Noise wall is not feasible. [1a]
Between 5223 and 4720 West S. SR-92, Highland, UT	None	N/A	Noise wall is not feasible. [1a]
Between 5100 and 4975 West N. SR-92, Highland, UT	Noise Wall: North-4	North-4 does mitigate for one receptor	Noise wall is not feasible. [1b]
Between 4975 and 4582 West N. SR-92, Highland, UT	None	N/A	Noise wall is not feasible. [1a]

Impacted Area Location	Modeling	Results	Comments
Between 4582 and 4361 West N. SR-92, Highland, UT	Noise Wall: North-5	North-5 does mitigate for four receptors	Noise wall is not reasonable. [2a]
Between 8970 and 9000 West S. SR-92 along EB Expressway, Lehi, UT	Noise Wall: South-1	South-1 does not reduce noise by 5 dBA	Noise wall is not feasible. [1b]

Notes:

1. *According to the UDOT NAC, a noise abatement measure is feasible when a substantial noise reduction is achieved. Factors that prevent a noise abatement measure from being classified as feasible include the following:*
   - *1a. Impacted area has several roadway access points that prevent the construction of one continuous noise barrier. Short barriers are ineffective.*
   - *1b. The noise wall studied cannot reduce noise for the majority of front row receivers by 5 dBA or more.*
   - *1c. Noise wall considered not feasible to mitigate for a single receptor because costs would exceed $30,000 per impacted benefited receiver.*
2. *A noise abatement measure is reasonable when the proposed noise abatement measure satisfies the cost criterion set in the UDOT Noise Abatement Policy. Factors that prevent a noise abatement measure from being classified as reasonable include the following:*
   - *2a. Modeled noise wall has a cost that exceeds $30,000 per impacted benefited receiver.*
   - *2b. Impacted receiver is in a park, and the total cost for the barrier needed to achieve a 5 dBA reduction is greater than $250 per linear foot.*

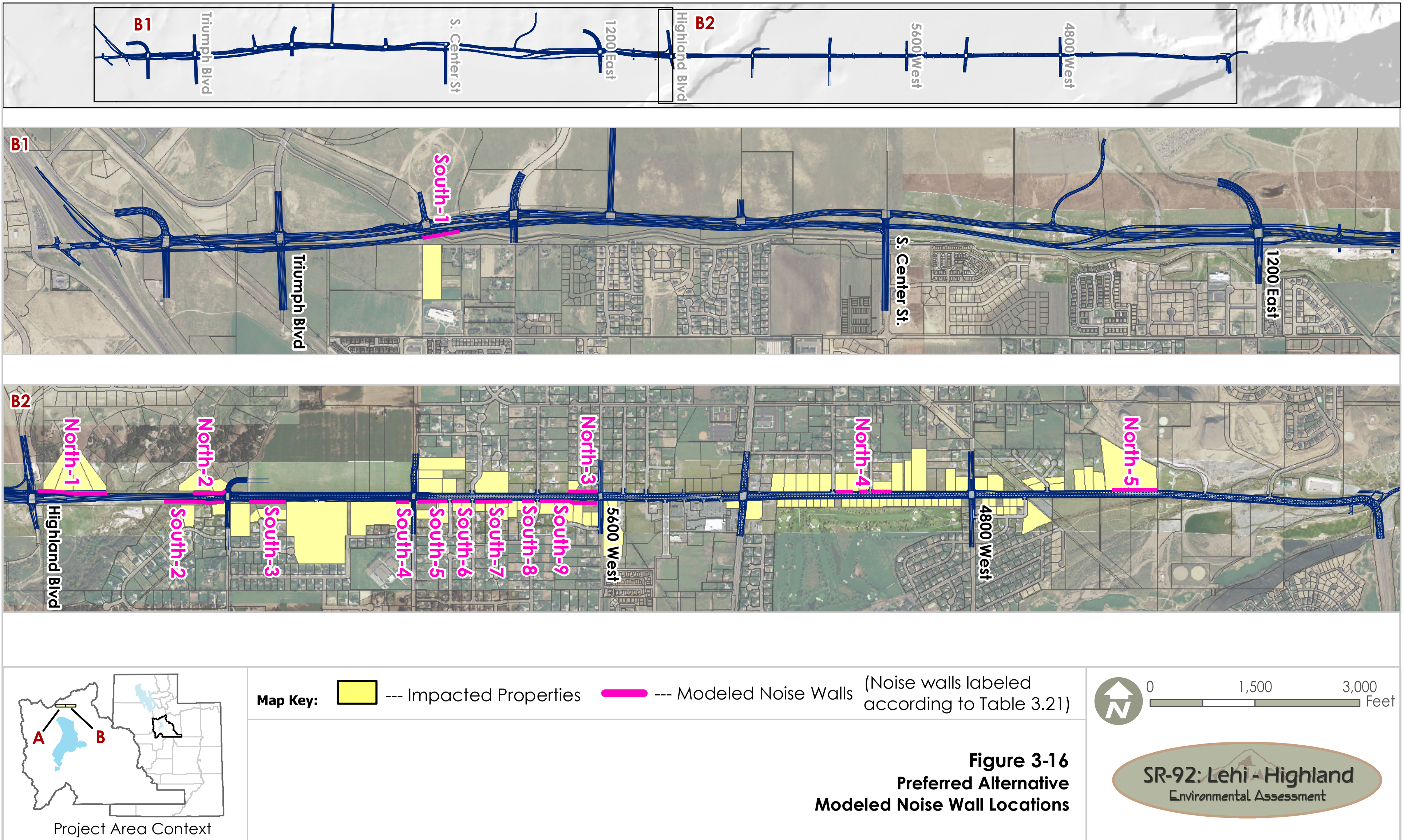

Figure 3-16
Preferred Alternative
Modeled Noise Wall Locations

With the implementation of the Preferred Alternative, it is estimated that the noise levels will increase along the majority of the SR-92 corridor. The number of impacted Category B properties increased from 82 to 103, and the number of Category C properties increased from zero to three. For the future No-Build Alternative, noise levels are expected to impact 132 Category B properties and three Category C properties. A majority of the estimated impacted properties are located near the roadway in Highland. Noise walls were examined as a mitigation option for the impacted Category B properties according to the UDOT Noise Abatement requirements. Only five of the modeled walls mitigated noise for impacted receptors. The five feasible noise walls were evaluated with the UDOT cost criterion, and none of the walls passed as a reasonable mitigation measure.

Several other techniques are available to reduce potential noise impacts along the project corridor. Modification of the horizontal and vertical alignments of the roadway may be considered a noise mitigation measure. However, due to the number of roadway access points and the location of homes and businesses along both sides of the corridor, realignment of the roadway is not feasible. Increasing the right-of-way width may reduce noise impacts; however, this would not be reasonable due to relocation costs.

Construction Noise

Noise will be generated as a result of construction activities and equipment. Temporary noise increases will affect adjacent land uses as improvements are constructed. These impacts will be short term and will shift as construction proceeds from one part of the project to another.

3.8 GEOLOGY, SOILS, AND TOPOGRAPHY

Regulatory Setting

Local planning codes, guidelines, zoning, and ordinances are used to manage land development and the associated geologic, soils, and topographic impacts in and adjacent to the SR-92 right-of-way.

Affected Environment

Geology

Geology in the study area was assessed by evaluating sediment and rock types, potential seismic activity, and potential landslide activity.

The study area is located in the northeast corner of Utah Valley, which can be found in the Basin and Range physiographic province. It is an ancient lacustrine basin filled with quaternary deposits and is underlain by several sediment types, including interbedded silts, clays, sands, and gravels (UGS 1996).

In addition to sediment types and geologic features, potential seismic activity within the study area was also assessed. Utah Geological Survey (UGS) maps identified three locations adjacent to the study area where earthquake hazard conditions exist. These include the railroad crossing near the western project terminus, the intersection of SR-74, and the area near the SR-146 junction (Hecker 1993).

UGS maps also identified potential landslide activity. A UGS map specifying statewide landslide activity indicated the presence of characteristic landslide morphology near the mouth of American Fork Canyon, which is located to the southeast of the eastern project terminus (Harty

1991). In addition, UGS completed a study of landslide activity along the Wasatch Front in response to a spike in activity in 1998 (Ashland 2003). No activity for the SR-92 study area was reported in this study.

The UGS and United States Geologic Survey (USGS) maps of liquefaction-induced landslides and liquefaction potential along the Wasatch Front indicate that liquefaction potential in response to a seismic event is very low in the study area (Anderson and others 1986; Harty 2003).

Soils

The surficial soil types in the study area consist of sand, loam, silt, and clay, which are soil types commonly found in the ancient Bonneville Shoreline and its near-shore deposits. Extensive gravel deposits also occur and include alluvial deposits associated with Dry Creek, American Fork Creek, and their associated tributaries (Anderson and others 1986).

To assess soil types further, a custom soil resource report for the study area was generated by USDA NRCS. The soil types mapped by NRCS for the study area include soil units that are characteristically prone to severe erosion, such as those units that occur on slopes of between 10 to 70 percent. Less than five percent of the study area contains soils exhibiting severe erosion potential (NRCS 2008). The NRCS reports that as much as 30 percent of the study area may include soil types exhibiting moderate erosion potential due to either slope or soil characteristics.

Topography

The elevation gain from the western termini at the I-15 interchange, which has an elevation of 4,660 feet above mean sea level, to the eastern termini at SR-146, which has an elevation of 5,050 feet above mean sea level, is approximately 400 feet. This elevation equals a composite grade of approximately one percent (USGS 1993 to 1994). Steeper slopes can be found where the existing roadway has been historically filled over natural features and where natural drainages and man-made channels intersect with the corridor. Natural watercourses and stormwater in the study area drain to the west and south towards Utah Lake.

Impacts

No-Build Alternative

The No-Build Alternative would not directly or indirectly impact the geologic environment, project soils, or existing topography. The No-Build Alternative could possibly be impacted by the presence and movement of fault zones. Additionally, the No-Build Alternative could be impacted from adjacent activities; these adjacent activities may take place on soils and slopes that exhibit erosion potential, possibly causing erosion and impacts to the No-Build Alternative.

Preferred Alternative

The Preferred Alternative would not impact or be impacted by the geologic environment. The Preferred Alternative could potentially be impacted by fault zones. Vertical structures or stormwater conveyance features associated with the Preferred Alternative could fail or not function if separated by an active fault.

The Preferred Alternative could potentially be impacted by soils and slopes that exhibit erosion potential. Structural elements requiring cut and fill slopes, utilities, and/or vegetation could fail or not function if soils or slopes eroded.

The Preferred Alternative would change the topography at many locations along the corridor due to the widening and realignment of the roadway. Generally, the east-west slope of the existing roadway would not change along the alignment as a result of either alternative because both the No-Build and Preferred Alternatives tie into existing transportation facilities at the project termini. However, the grades proposed in the Preferred Alternative would be adjusted where the roadway must be raised or lowered to accommodate intersection improvements, lane additions, separated lanes (e.g., arterial and express), and existing or relocated utilities. Indirect impacts of these grade changes include potential visual quality impacts as described in further detail in Section 3.17.

Mitigation

If the Preferred Alternative is selected, geotechnical investigations, in accordance with UDOT requirements, will be conducted as part of the design-build phase. Best practices will be implemented during the design and construction of the project. No other mitigation is proposed.

3.9 WATER RESOURCES

Regulatory Setting

Federal Rules

Rivers, streams, lakes, wetlands, and other special aquatic sites are regulated as *waters of the United States* by the U.S. Army Corps of Engineers (USACE) in accordance with Section 404 of the Federal Clean Water Act (CWA). Section 404 authorizes USACE to regulate certain activities involving the discharge of dredged or fill material into waters of the United States. Responsibility for administering and enforcing Section 404 is shared with EPA.

EPA defines special aquatic sites as geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values (USGPO 2008a). Special aquatic sites include, but are not limited to, wetlands, mudflats, playas, vegetated shallows, and pool and riffle complexes.

Both EPA and USACE define jurisdictional wetlands as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USGPO 2008b).

If the proposed action results in the filling of waters of the United States, a CWA Section 404 permit is required. This permit is administered through USACE and typically includes mitigation measures that must be met as part of the proposed action. Man-made ditches and canals may also be subject to Section 404 regulation if they convey surface water connections flows that could potentially discharge a pollutant into waters of the United States. For rivers, streams, ponds, ditches, and other non-wetland waters, USACE regulates fill activities that occur below the ordinary high water mark (OHWM).

EO 11990 Protection of Wetlands, issued on May 24, 1977, directs federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands (USGPO 2008c). EO 11990 also directs federal agencies to avoid undertaking or providing assistance to new construction located in wetlands unless there are no practicable alternatives to such construction and the proposed action includes all practicable measures to minimize adverse impacts (42 CFR 26961).

State of Utah Rules

The Utah State Engineers Office, through the Utah Division of Water Rights' (DWRi's) Stream Alteration program, regulates the state's rivers and streams. A state stream alteration permit is required for actions that will alter the physical characteristics of stream channels below the bankfull elevation (i.e., the OHWM) or the physical characteristics of stream banks up to 30 feet perpendicular distance from the bankfull elevation.

Methodology

The study area for the water resources assessment was limited to a 353-acre corridor that generally followed the centerline of the existing SR-92 road alignment between the I-15 interchange and the mouth of American Fork Canyon; see Figure 3-1 for more detail. The 353-acre corridor contains all land and water bodies that could potentially be directly impacted by the Preferred Alternative's construction. This corridor includes approximately 349 acres of land and approximately four acres of ditches, canals, and streams.

Site inspections were conducted to identify and delineate the locations of wetlands, streams, rivers, canals, ditches, and other water bodies within the study area. The OHWM of delineated water bodies were marked in the field, surveyed, and incorporated into a geographic information science (GIS) database. The GIS database was used to calculate potential impacts to stream channels, wetlands, canals, and ditches.

The OHWM is analogous to bankfull (i.e., the incipient point of overbank flooding). Published stream flow data was queried for delineated streams. The presence of wetlands was identified in accordance with the 1987 *USACE Wetland Delineation Manual* and the 2006 *Interim Regional Supplement to the USACE Wetland Delineation Manual: Arid West Region*. The OHWM for stream channels was delineated using methods and guidelines set forth by USACE. A stream channel and wetland delineation report was prepared by Frontier Corporation USA and was submitted to USACE for review and approval. The report was revised on April 22, 2008 and again in July 2008 to reflect a larger study area. As of publication of this EA, USACE has not issued a jurisdictional determination.

Affected Environment

No wetlands are present within the SR-92 study area. Water resources are limited to the stream channels of Dry Creek and the American Fork River, seven man-made canals and ditches, and three aqueducts shown on Figure 3-17. The following water features have the potential to be regulated by USACE as waters of the U.S.:

- Dry Creek
- American Fork River
- Provo Reservoir Canal
- Bull River Ditch
- Lehi Ditch
- Unnamed Lateral to Lehi Ditch
- Wynn Ditch
- Pleasant Grove Ditch
- American Fork Ditch

Although it is the sole responsibility of USACE/EPA to determine jurisdiction under the CWA, it is the Bureau of Reclamation's opinion that the Provo Reservoir Canal does not meet the conditions of waters of the United States because it does not flow into a traditional navigable waterway.

Rivers and Streams

Dry Creek

Dry Creek originates in the Traverse and Wasatch Mountains approximately four miles to the north and east of the study area. The creek flows toward the southwest and crosses the existing SR-92 roadway through a concrete culvert near the middle of the study area. The Bull River Ditch diverts flow from Dry Creek about 2.5 miles upstream from the study area. Downstream from the study area, the stream channel has been highly modified, straightened, and/or relocated for flood control and irrigation. The creek crosses I-15 and eventually discharges into Utah Lake about 6.6 miles southwest of the study area.

Dry Creek's average channel width at the OHWM is approximately 35 feet with an average channel depth between 1.5 and 2.0 feet. The large width to depth ratio is due to channel modifications caused by a downstream flood control dam. Cottonwood, box elder, and willows border the stream corridor; however, no wetlands were delineated in the study area above the OHWM due to the modified condition of the channel.

Stream flows are typically greatest during the spring runoff period and become intermittent during the summer. The maximum measured flow for Dry Creek was 750 cubic feet per second (cfs) and resulted from a severe thunderstorm in August 1951 (FEMA 2002). The recurrence interval for an event of this magnitude is estimated to be 30 years. Base flows during the growing season have been highly modified by irrigation diversions. Between April 15 and July 10, a maximum of 30 cfs is diverted into the Bull River Ditch about 1.25 miles upstream from the study area. Between June 10 and October 15, the towns of Alpine, Draper, and Highland appropriate the remaining flows in Dry Creek for irrigation use (Carter 2007). The reach of Dry Creek that occurs within the study area was given the lowest aquatic resource designation by the Utah Division of Wildlife, a Class VI designation, because of upstream flow diversions and the presence of physical barriers that can obstruct aquatic life movement (Green 2007).

American Fork River

The American Fork River originates within the Lone Peak Wilderness of the Wasatch Mountains. The river flows to the southwest and crosses the study area near the mouth of American Fork Canyon. The river continues toward the southwest, crosses I-15, and drains into Utah Lake approximately 7.25 miles downstream from the study area. Average channel width at the OHWM is approximately 30 feet with an average channel depth of about three to four feet.

The American Fork River has perennial flow during most years. A gauge station that is presently monitored by the National Oceanic and Atmospheric Administration (NOAA) is located about four miles upstream from the study area. Bankfull flow averages about 640 cfs and usually occurs during the spring runoff (NOAA 2008). The maximum measured flow for the American Fork River resulted from a severe thunderstorm in August 1951 (FEMA 2002). A peak flow of 645 cfs was recorded at the gage station. A peak flow of 1,000 cfs was estimated at the mouth of the American Fork Canyon for the same event. The recurrence interval for a flood with this magnitude is approximately 30 years (FEMA 2002). A flood control and debris basin was built immediately south of the SR-92 study area to protect downstream properties from flood hazards.

The American Fork River is highly appropriated for irrigation use. During the April 15 to October 15 irrigation season, Lehi, Pleasant Grove, American Fork, Mitchell, and Wynn ditches convey water diverted from the American Fork River. The cities of Highland and American Fork appropriate the largest share of the water from these ditches.

A diversion dam with multiple ditch weirs is the main point of irrigation diversion. The dam is located on the north side of the study area. Consequently, the American Fork River usually has very low flows downstream from the study area during the irrigation season. The reach of American Fork River that occurs within the study area was given the lowest aquatic resource designation by the Utah Division of Wildlife Resources (DWR), a Class VI designation, because of upstream flow diversions and the presence of physical barriers that can obstruct aquatic life movement (Green 2007).

Construction of the debris basin immediately south of SR-92 has likely changed the base level and slope of the American Fork River, causing bedload to deposit within the channel. Reduced channel slope and reduced bedload transport capability have probably caused the formation of several braided channels. Loss of bedload transport capability is likely causing the American Fork River to migrate northward and eroding the toe of fill for SR-92. Jersey barriers were placed at the toe of fill in the channel as an emergency measure to stop the erosion. DWRi issued a stream alteration permit for this stabilization on the condition that a long-term plan would be developed. Through coordination with DWRi, it was agreed that the long-term plan could be incorporated into the SR-92 project to be consistent with roadway improvements.

Ditches and Canals

<u>Provo Reservoir Canal</u>

The Provo Reservoir Canal is a main component of the Provo River project. It is owned by Reclamation but is maintained and operated by PRWUA. The canal originates from a diversion on the Provo River approximately 13 miles southeast of the SR-92 study area. It is one of three major arteries that supplies drinking water to the Salt Lake Valley. The canal delivers water used by Salt Lake City, areas of unincorporated Salt Lake County, Sandy City, Provo City, Orem City, Lindon City, Pleasant Grove City, American Fork City, Lehi City, Highland City, and JVWCD, which delivers to Murray, the City of South Salt Lake, Holladay City, Taylorsville, South Jordan, West Jordan, Riverton, Bluffdale, Herriman, Draper, and Granger-Hunter Improvement District (Denos 2008).

The Provo Reservoir Canal enters the study area from the southeast at approximately mile point (MP) 3.1. The canal is about four to five feet deep and 16 to 18 feet wide and has the capacity to convey approximately 550 cfs. The canal is earth-lined and maintained to minimize the presence of vegetation within the canal.

The canal flows westward within and adjacent to the study area for approximately 2.1 miles. It crosses under SR-92 at MP 0.25 and flows northwest toward its terminus at the point of the mountain. At this location, canal water is siphoned under the Jordan River and split into several facilities associated with the final delivery. These facilities include the Welby Canal, the Jacob Canal, Salt Lake City Water Conservancy District's Bluffdale water treatment plant, and Reach 4 of the Jordan Aqueduct (PRWUA 2008). Reclamation is in the process of transferring the title for the Provo Reservoir Canal over to the PRWUA. When this happens, PRWUA plans to enclose the canal.

Bull River Ditch

The Bull River Ditch originates from a diversion on Dry Creek about 2.5 miles upstream from the study area. The ditch enters and crosses the study area from the north at approximately MP 3.7 on the west side of Dry Creek. The Bull River Ditch turns west and parallels SR-92 and Provo Reservoir Canal for about 2.8 miles. At roughly MP 0.25, the Bull River Ditch crosses under SR-92 and flows northwest to the Pilgrim's Landing area where it terminates. Any ditch flows that make it to the Pilgrim's Landing area are captured in a constructed pond with no outlets (Carter 2007). The Bull River Ditch generally has a nine-foot bottom width to accommodate periodic cleanout by a backhoe. Also within the study area is a small lateral ditch off the Bull River Ditch that crosses the 1200 West extension area. Return flows from the unnamed ditch line appear to dissipate in uplands.

The diversion from Dry Creek allows for a maximum of 30 cfs flow. The ditch also captures runoff from the Woods Hollow and Maple Hollow drainages on the north side of the SR-92 study area. Neither of these drainages have a stream channel with a defined OHWM, although they do convey runoff during large precipitation events. If the Bull River Ditch is flowing at capacity, runoff from the Woods Hollow and Maple Hollow drainages will spill over the ditch and follow the drainages southward until they discharge into Dry Creek. The Bull River Ditch is managed by the North Bench Irrigation Company and is owned by the ditch stakeholders, including the cities of Alpine, Highland, and Draper. Summer water rights for this ditch run from April 15 to July 10. There are also a few water rights for winter stock watering. After July 10, all water from Dry Creek is allotted to the City of Alpine and water is no longer diverted into the ditch (Carter 2007).

Lehi, American Fork, Wynn, and Pleasant Grove Ditches

The Lehi, American Fork, Pleasant Grove, and Wynn Ditches as well as smaller lateral ditches convey flow diverted from the American Fork River at the mouth of the American Fork Canyon. A diversion dam and weir facility on the north side of SR-92, near the intersection of SR-146, proportions the American Fork River into the Lehi, American Fork, and Pleasant Grove Ditches. The American Fork Ditch Company manages the diversion facility, diverting as much flow as possible between April 15 and October 15 each year. The weirs on the diversion dam can accommodate up to 190 cfs of flow diversions. Excess river flow during spring runoff and rainstorm events spills through a concrete overflow outlet and back into the American Fork River, which crosses SR-92 through an existing culvert.

The Lehi and American Fork Ditches run westward from the diversion facility on the north side of SR-92. The Lehi Upper South Club lateral ditch splits off from the Lehi Ditch on the north side of SR-92. Both ditches cross SR-92 and run westward parallel to the SR-92 roadway. An unnamed lateral splits off from the Lehi Ditch and also runs parallel to SR-92. Return flows from both ditches drain into Dry Creek.

The Mitchell Ditch and Wynn Ditch split off from the American Fork Ditch. The Wynn Ditch splits from the American Fork Ditch north of SR-92 and crosses under SR-92 separately. The Mitchell Ditch splits from the American Fork Ditch on the south side of SR-92 outside of the study area; therefore, the Mitchell Ditch is located outside the study area. Return flows from the American Fork Ditch drain into the American Fork River. Return flows from the Wynn Ditch drain into Dry Creek.

The Pleasant Grove Ditch runs southward from the diversion facility on the American Fork River. The ditch crosses SR-92 and flows on the east side of the Cedar Hills Golf Course. Return flows from the Pleasant Grove Ditch drain into the American Fork River.

A lateral ditch off the Lehi Ditch runs parallel to the roadway along the south side of SR-92. The American Fork Ditch further splits into the Wynn ditch and the Mitchell Ditch. The Wynn Ditch splits from the American Fork Ditch north of SR-92 and crosses under SR-92 separately. The Mitchell Ditch splits from the American Fork Ditch south of the SR-92 study area.

Return flows from the American Fork Ditch and Pleasant Grove Ditch drain into the American Fork River. Return flows from the Lehi Ditch and possibly the Wynn Ditch drain into Dry Creek.

Aqueducts

Jordan Aqueduct

The Jordan Aqueduct was built as part of the Central Utah Project to transport water diverted from the Provo River to Salt Lake City. The aqueduct is owned by Reclamation and operated by JVWCD in conjunction with MWDSLS and CUWCD (Hickman 2008). The aqueduct runs parallel to the Provo Reservoir Canal. It crosses under SR-92 approximately 500 feet east of 1200 East and parallels SR-92 on the north side to approximately 1500 West where it turns north.

Salt Lake Aqueduct

The Salt Lake Aqueduct transports water from Deer Creek Reservoir to the Little Cottonwood Water Treatment Plant. It is fully owned and operated by MWDSLS. The concrete, gravity-fed aqueduct begins at the base of Deer Creek Reservoir, runs down Provo Canyon, and continues north to the Little Cottonwood Water Treatment Plant (MWDSLS 2004). It crosses under SR-92 approximately 800 feet east of 4800 West.

Alpine Aqueduct Reach 3

The Alpine Aqueduct Reach 3 was built as a part of the Central Utah Project to convey municipal and industrial water to North Utah County. It extends from the mouth of Provo Canyon north to Lehi and parallels the Jordan Aqueduct. It is a welded steel pipe with a diameter of 18 to 48 inches and crosses under SR-92 approximately 500 feet east of 1200 East. This aqueduct shares Jordan Aqueduct's right-of-way. It is owned by Reclamation and operated by CUWCD (Hickman 2008).

Alpine Aqueduct Reach 3 North Branch

The Alpine Aqueduct Reach 3 North Branch was built as part of the Central Utah Project to convey municipal and industrial water to North Utah County. It extends from the mouth of Provo Canyon north to Lehi and south to Provo. The Alpine Aqueduct Reach 3 North Branch is a 36-inch welded steel pipe that crosses under SR-92 at approximately 4300 West. This reach provides culinary water for the cities of Alpine, Highland, and Cedar Hills. It is owned and operated by CUWCD.

Wetlands

No wetlands were delineated in association with the American Fork River or Dry Creek. The presence of jurisdictional waters subject to CWA regulation is limited to the OHWM of these stream channels. Riparian vegetation bordering these stream channels includes box elder, cottonwood, Douglas hawthorn, red-osier dogwood, sandbar willow, woods rose, and currant. Similarly, no wetlands were delineated in association with the Provo Reservoir Canal or the various irrigation ditches, although riparian vegetation is also present along certain segments of these irrigation ditches.